Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A device for manipulating a direction of motion of current carriers, the device comprising a structure containing a two-dimensional gas of the current carriers configured to define at least one region of inhomogeneity characterized by a substantially varying value of at least one parameter selected from a spin-orbit coupling constant, density of the spin carrying current carriers, and a mobility of the gas, wherein ~~the device having one of the following configurations~~:

~~(i)~~ said structure is configured to provide the two-dimensional gas configuration with a desired orientation between an input flux of the spin carrying current carriers and said at least one region of inhomogeneity, which has the varying spin-orbit coupling constant and/or has the varying density of the spin carrying current carriers provided the spin-orbit coupling constant is of non-zero value,

said desired orientation being such that the input flux of the spin carrying current carriers contains the carriers that impinge onto said at least one region of inhomogeneity at a certain range of non-zero angles of incidence,

the device being thereby operable to perform spin manipulations of the input flux to provide at least one of the following types of deviation of said spin carrying current carriers: spin dependent refraction, spin dependent reflection and spin dependent diffraction on desired deviation angles of a direction of motion of the spin carrying current carriers being incident on said at least one region of inhomogeneity~~,~~

~~and (ii) said structure is configured to create the region of inhomogeneity in the form of a lateral interface between first and second regions differing from each other at least in the gas mobility such that the first region is diffusive and the second region is ballistic, the device being thereby operable for emitting the current carriers from the diffusive region into the ballistic region with a wide angular range of directions of propagation of the current carriers in the ballistic region, thereby enabling directing the current carriers to one or more desired range of angles of propagation in the ballistic region~~.

2. (Cancelled).

3. (Original) The device of claim 1 wherein said structure is configured such that the inhomogeneous two-dimensional gas is confined by at least one potential well.

4. (Original) The device of claim 3 wherein the potential well is created in a semiconductor structure.

5. (Original) The device of claim 4 wherein said structure is a semiconductor heterostructure.

6. (Currently Amended) The device of claim 1 ~~(i)~~ wherein said structure is configured such that the inhomogeneous two-dimensional gas is confined by at least one nonuniform potential well.

7. (Original) The device of claim 6 wherein at least one portion of said at least one nonuniform potential well is an asymmetrical potential well.

8. (Original) The device of claim 6 wherein at least one part of the structure is fabricated from a uniaxial crystal compound with no inversion symmetry.

9. (Original) The device of claim 6 wherein the nonuniform potential well is created in a semiconductor structure.

10. (Original) The device of claim 9 wherein said structure is a semiconductor heterostructure.

11. (Original) The device of claim 10 wherein the semiconductor heterostructure is fabricated from compounds selected from group III – group V, and group II – group VI compounds.

12. (Original) The device of claim 11 wherein the semiconductor heterostructure is selected from $In_xGa_{1-x}As/In_yAl_{1-y}As$, $In_xGa_{1-x}As/InP$, InAs/AlSb, $In_xAl_{1-x}As/In_yGa_{1-y}As/ In_zAl_{1-z}As$, CdTe/HgTe/CdTe and $Hg_xCd_{1-x}Te$.

13. (Original) The device of claim 12 wherein x, y and z are in the range of about 0.1 to 1.

14-22. (Cancelled).

23. (Original) The device of claim 1 comprising at least one gate configured for applying a bias voltage thereto, said bias voltage being sufficient to change said at least one parameter in a region of the two-dimensional gas near said at least one gate to thereby create the region of inhomogeneity.

24. (Currently Amended) The device of claim 1~~(i)~~ wherein the varying of the spin-orbit coupling constant of the gas within the region of inhomogeneity of the gas measured in units of Fermi velocity is larger than about 0.001.

25. (Cancelled).

26. (Original) The device of claim 1 wherein the current carriers are selected from electrons and holes.

27. (Original) The device of claim 1 comprising at least one injector terminal and at least one collector terminal distant from each other, each terminal being defined by a space between two nearest barriers arranged in said structure, the terminals being arranged for allowing the carriers passage from the injector terminal to the collector terminal.

28. (Currently Amended) The device of claim 1~~(i)~~ comprising at least one injector terminal and at least one collector terminal distant from each other, each terminal being defined by a space between two nearest barriers arranged in said structure, the terminals being arranged for allowing the carriers passage from the injector terminal to the collector terminal.

29. (Cancelled).

30. (Original) The device of claim 28 wherein said at least one injector terminal is configured for providing the input flux of unpolarized spin carrying current carriers, and said at least one collector terminal

is configured for receiving a current of spin-polarized spin carrying current carriers, the device being therefore configured and operable as a spin filter for producing a current of spin carriers having the predetermined spin polarization.

31. (Original) The device of claim 28 wherein said at least one injector terminal is configured for providing the input flux of unpolarized spin carrying current carriers, and the at least two collector terminals are configured, each for receiving currents of the spin polarized spin carrying current carriers, the device being therefore configured and operable as a spin polarization splitter.

32. (Original) The device of claim 31 comprising a charge sensor arranged at said at least one collector terminal and configured for receiving a flux of the spin carrying current carriers having the predetermined spin polarization; the device being thereby configured and operable as a spin detector for detecting a spin polarization of the spin carriers.

33-35. (Cancelled).

36. (Currently Amended) The device of claim 1~~(i)~~ wherein said structure is configured to create the region of inhomogeneity in the form of a lateral interface between two regions of the gas having different values of the spin-orbit coupling constant and/or different values of the density of the spin-carrying current carriers provided the spin-orbit coupling constant is of a non-zero value in at least one of these regions.

37. (Original) The device of claim 36 wherein said lateral interface has a curved geometry.

38. (Currently Amended) The device of claim 1~~(i)~~ wherein said structure is configured to define the region of inhomogeneity of the gas having a lens-like geometry with a relatively reduced or relatively enhanced spin-orbit coupling constant and/or the density of the spin-carrying current carriers as compared to the gas surroundings of said lens-like region.

39. (Currently Amended) The device of claim 1~~(i)~~ wherein the region of inhomogeneity is configured as a spin zone pattern so as to provide for focusing the input flux of the spin-carrying current carriers based on the spin dependent diffraction.

40. (Currently Amended) The device of claim 1~~(i)~~ wherein said structure is configured to create the region of inhomogeneity in the form of an elongated stripe which has the relatively reduced or relatively enhanced spin-orbit coupling constant and/or the density of the spin-carrying current carriers as compared to the gas surroundings of said stripe.

41. (Original) The device of claim 40, wherein said desired orientation is such that at least one spin polarization component of the input flux of the spin-carrying current carriers undergoes total internal reflection while passing along the stripe.

42. (Original) The device of claim 40, wherein said desired orientation is such that the at least one

polarization component of the input flux of the spin-carrying current carriers undergoes total internal reflection while passing through the stripe.

43. (Original) The device of claim 40 wherein said stripe has a curved geometry.

44. (Original) The device of claim 43 wherein said stripe has a closed loop shape.

45. (Currently Amended) The device of claim 1~~(i)~~ wherein said at least one region of inhomogeneity of the gas is configured for redirecting the spin carrying current carriers, thereby to provide a spin focusing of the spin carrying current carriers.

46. (Currently Amended) The device of claim 1~~(i)~~ wherein said at least one region of inhomogeneity of the gas is configured for guiding the spin polarized spin carrying current carriers along said region of inhomogeneity of the gas owing to the total internal reflection of the spin carrying current carriers to convey

the spin current to a predetermined location in the device, to thereby provide a spin guide.

47. (Original) The device of claim 46 wherein said spin guide is configured in the shape of a closed loop having an entrance and at least one exit; to thereby provide a spin storage of the spin carrying current carriers.

48. (Currently Amended) The device of claim 1~~(i)~~ further comprising a gate configured for altering a bias voltage being sufficient to affect said inhomogeneous two-dimensional gas of spin carrying current carriers, said bias voltage being applied to the gate for switching the deviation angles of at least a portion of the spin carrying current carriers between different predetermined ranges of angles; thereby to provide a spin switch device.

49. (Cancelled).

50. (Original) A device for manipulating a direction of motion of current carriers, the device

comprising a structure containing a two-dimensional gas of the current carriers configured to define at least one region of inhomogeneity characterized by a substantially varying value of a spin-orbit coupling constant or characterized by a substantially varying value of density of the spin carrying current carriers provided the spin-orbit coupling constant is of non-zero value, the structure being configured to provide a desired orientation between an input flux of unpolarized spin-carrying current carriers and said at least one region of inhomogeneity, the device being thereby configured and operable as a spin filter for producing a current of spin carriers having a predetermined spin polarization.

51. (Original) A device for manipulating a direction of motion of current carriers, the device comprising a structure containing a two-dimensional gas of the current carriers configured to define at least one region of inhomogeneity characterized by a substantially varying value of a spin-orbit coupling constant or characterized by a substantially varying value of density of the spin carrying current carriers provided the spin-

orbit coupling constant is of non-zero value, the structure being configured to provide a desired orientation between an input flux of unpolarized spin-carrying current carriers and said at least one region of inhomogeneity, the device being therefore configured and operable as a spin polarization splitter.

52. (Original) A device for manipulating a direction of motion of current carriers, the device comprising a structure containing a two-dimensional gas of the current carriers configured to define at least one region of inhomogeneity characterized by a substantially varying value of a spin-orbit coupling constant or characterized by a substantially varying value of density of the spin carrying current carriers provided the spin-orbit coupling constant is of non-zero value, the structure being configured to provide a desired orientation between an input flux of spin-carrying current carriers and said at least one region of inhomogeneity, said at least one region of inhomogeneity of the gas being configured for redirecting the spin carrying current

carriers, thereby to provide a spin focusing of the spin carrying current carriers.

53. (Original) A device for manipulating a direction of motion of current carriers, the device comprising a structure containing a two-dimensional gas of the current carriers configured to define at least one region of inhomogeneity characterized by a substantially varying value of a spin-orbit coupling constant or characterized by a substantially varying value of density of the spin carrying current carriers provided the spin-orbit coupling constant is of non-zero value, the structure being configured to provide a desired orientation between an input flux of spin-carrying current carriers and said at least one region of inhomogeneity, said at least one region of inhomogeneity of the gas being configured for guiding the spin polarized spin carrying current carriers along said region of inhomogeneity of the gas owing to the total internal reflection of the spin carrying current carriers to convey the spin current to a predetermined location in the device, to thereby provide a spin guide.

54. (Original) A device for manipulating a direction of motion of current carriers, the device comprising a structure containing a two-dimensional gas of the current carriers configured to define at least one region of inhomogeneity characterized by a substantially varying value of a spin-orbit coupling constant or characterized by a substantially varying value of density of the spin carrying current carriers provided the spin-orbit coupling constant is of non-zero value, the structure being configured to provide a desired orientation between an input flux of spin-carrying current carriers and said at least one region of inhomogeneity, said at least one region of inhomogeneity of the gas being configured in the shape of a closed loop having an entrance and at least one exit for guiding the spin polarized spin carrying current carriers along said region of inhomogeneity owing to the total internal reflection of the spin carrying current carriers, to thereby provide a spin storage of the spin carrying current carriers.

55. (Original) A device for manipulating a direction of motion of current carriers, the device

comprising a structure containing a two-dimensional gas of the current carriers configured to define at least one region of inhomogeneity characterized by a substantially varying value of a spin-orbit coupling constant or characterized by a substantially varying value of density of the spin carrying current carriers provided the spin-orbit coupling constant is of non-zero value, the structure being configured to provide a desired orientation between an input flux of spin-carrying current carriers and said at least one region of inhomogeneity, and comprising a gate configured for altering a bias voltage being sufficient to affect said inhomogeneous two-dimensional gas of spin carrying current carriers, said bias voltage being applied to the gate for switching deviation angles of at least a portion of the spin carrying current carriers between different predetermined ranges of angles; thereby to provide a spin switch device.

56. (Original) A device for manipulating a direction of motion of current carriers operable as signal splitter, the device comprising a structure containing a two-dimensional gas of current carriers configured to

define a region of inhomogeneity in the form of a lateral interface between first and second regions differing from each other in at least the gas mobility such that the first region is diffusive and the second region is ballistic, thereby providing for emission of the current carriers indicative of the input signal from the diffusive region into the ballistic region with a wide angular range of directions of propagation of the current carriers in the ballistic region, thereby splitting the input signal into spatially separated components propagating with desired ranges of angles of propagation in the ballistic region.

57-97. (Cancelled).